

Development of Hydrogen Education Programs for Government Officials

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Project Overview

- **Timeline**
 - August 1, 2008 thru July 31, 2011
- **Budget**
 - \$191,611 DOE Share
 - \$12,000 Participant Share
- **Barriers**
 - Mixed Messages can create potential for conflicting public messages
 - Disconnects between hydrogen information and dissemination networks
 - Difficulties of measuring success
- **Partners**
 - Municipal Association of South Carolina (MASC)
 - South Carolina Energy Office (SCEO)
 - South Carolina Fire Marshal's Office (SFMO)
 - SC American Planners Association (SCAPA)
 - Greenway Energy LLC

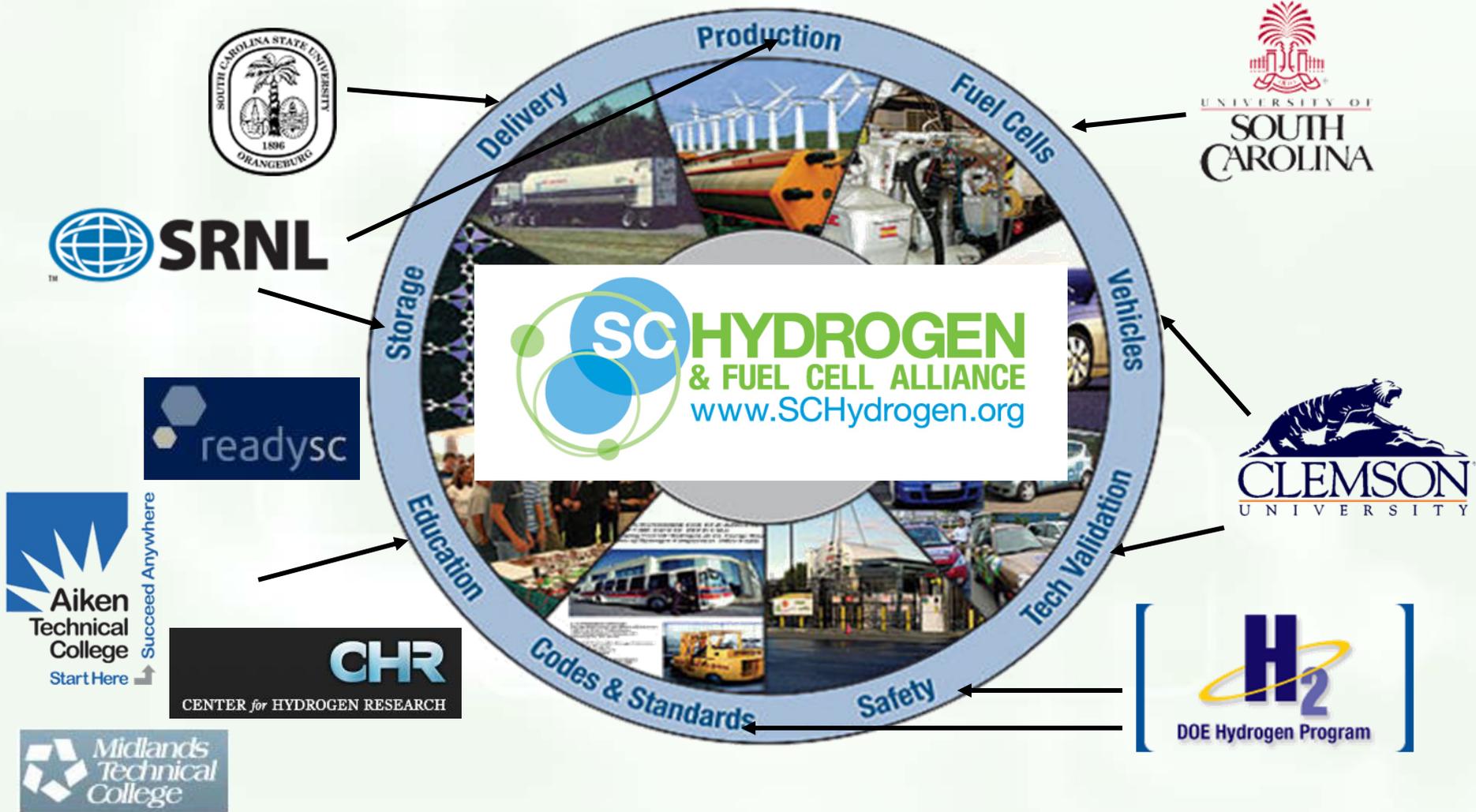
The South Carolina Hydrogen and Fuel Cell Alliance

- A non-profit partnership of academic, government and businesses coordinating resources in South Carolina to advance the commercialization of hydrogen and fuel cells.
- Areas of focus:
 - Education and Outreach
 - Infrastructure Development
 - Policy Development and Implementation
 - Research and Technology Transfer



Collaborations

South Carolina's Hydrogen Economy



Relevance

Hydrogen 101: State and Local Government Education

- To accelerate the on-going construction of the hydrogen economy in South Carolina by providing accurate and reliable information to state and local decision-makers.
- Challenges to overcome:
 - Lack of adequate educational materials
 - Mixed messages about hydrogen and alternative energy technologies
 - Inefficient dissemination of hydrogen educational materials
 - Lack of educated trainers

Collaborations

Project Partners

- **Supporting Partners**

- Municipal Association of South Carolina
- The South Carolina Energy Office
- The South Carolina Chapter of the American Planners Association
- Office of the State Fire Marshal (SC)

- **Primary Partner**

- Greenway Energy LLC
 - Hydrogen energy consulting firm
 - Hydrogen & fuel cell research
 - Energy-based economic development
 - Energy related workforce development
 - South Carolina based small business
 - Contracts with many SCHFCA members



Approach

- Assess the needs of the program and the team
- Design the decision-maker targeted program
- Develop the training materials
- Deploy materials to the audience to be educated
- Evaluate the educational program

Approach

Assessment and Early Evaluation

- State and Local Government Official's Concerns
 - Community Development
 - Economic Development (Industry Recruitment)
 - Workforce Development (Applied Education)
 - Job Creation
 - Public Safety
 - New Project Funding

Technical Accomplishments

H₂ Applications in the Near Future

- **Battelle Report identifies key early PEM fuel cell markets:**

- **Back-up Power**
- **Lift Trucks**
- **Airport vehicles**



Identification and Characterization of Near-Term Direct Hydrogen Proton Exchange Membrane Fuel Cell Markets



By
K. Mahadevan, K. Judd, H. Stone,
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Prepared for
U.S. Department of Energy
Golden Field Office
Golden, CO

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Final Version April 2007

Battelle
The Business of Innovation

Technical Accomplishments

Cost Advantages

- PEM fuel cells can provide service at substantially lower total cost than current technologies:

Net Present Value of Total Cost of Backup Power Systems for Emergency Response Radio Towers

	Outdoor Installations			Indoor Installations		
	Battery/Generator	PEM Fuel Cell with no tax incentive	PEM Fuel Cell with \$1K/kW incentive	Battery Only	PEM Fuel Cell with no tax incentive	PEM Fuel Cell with \$1K/kW tax incentive
8-hour run time				\$19,037	\$14,023	\$12,136
52-hour run time	\$61,082	\$61,326	\$56,609			
72-hour run time	\$47,318	\$33,901	\$32,014			
176-hour run time	\$75,575	\$100,209	\$95,491			

Source: Identification and Characterization of Near-term Direct Hydrogen Proton Exchange Membrane Fuel Cell Markets, Battelle Memorial Institute (April 2007).

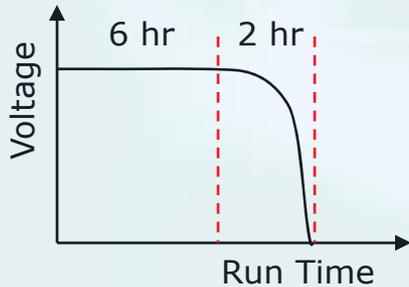
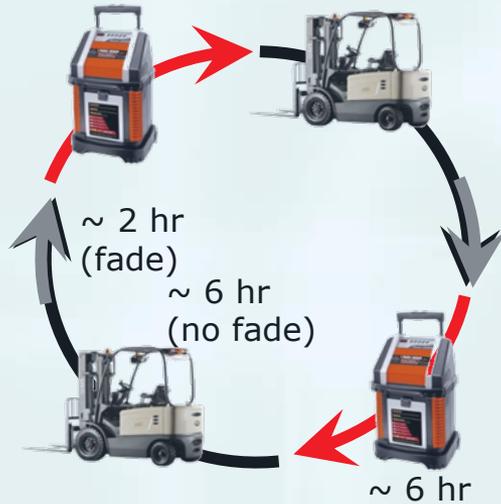
(the higher cost of the 176-hour fuel cell system results from the cost of hydrogen storage tank rental)

Note: The current PEM Fuel Cell tax credit is \$3000 / kW, 3 times the amount in this table!

Technical Accomplishments

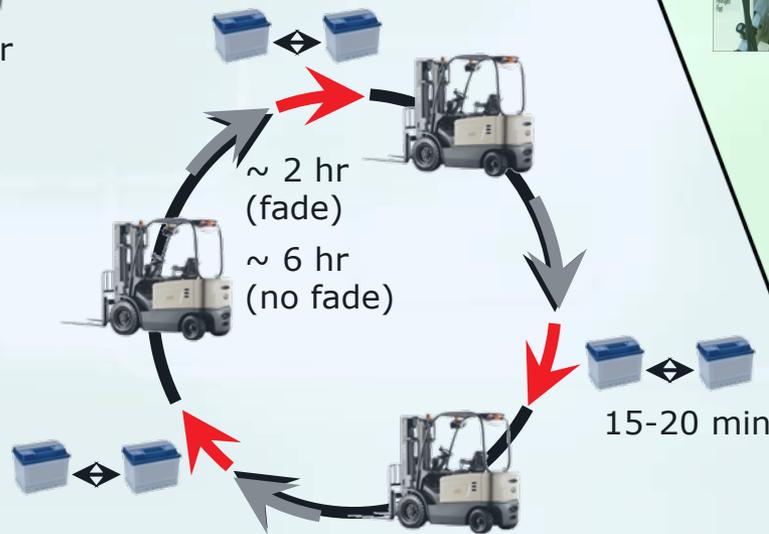
Battery vs. Fuel Cell Forklifts

Battery Forklift & Charging Station

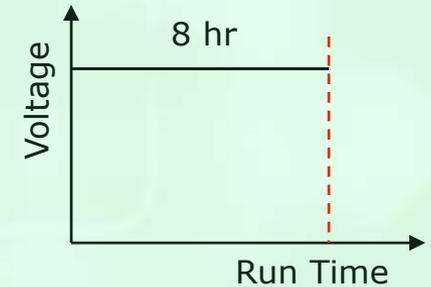
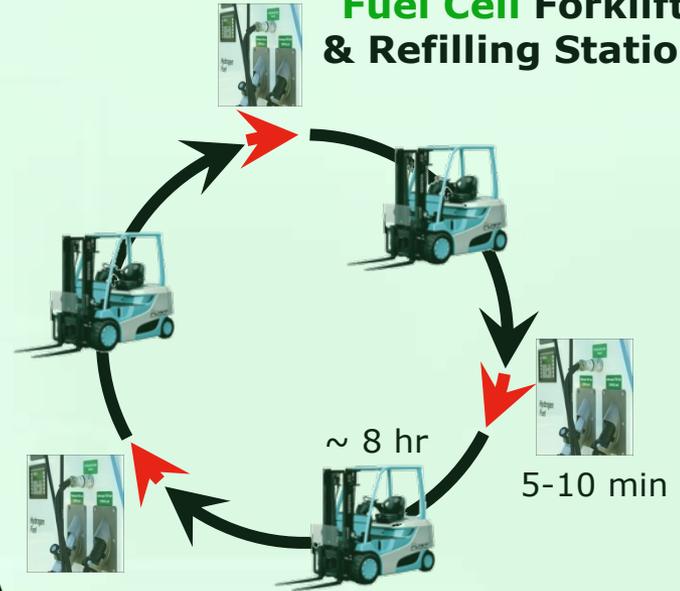


Difficulty to Steer During Voltage Fade

Battery Forklift & Changing Battery



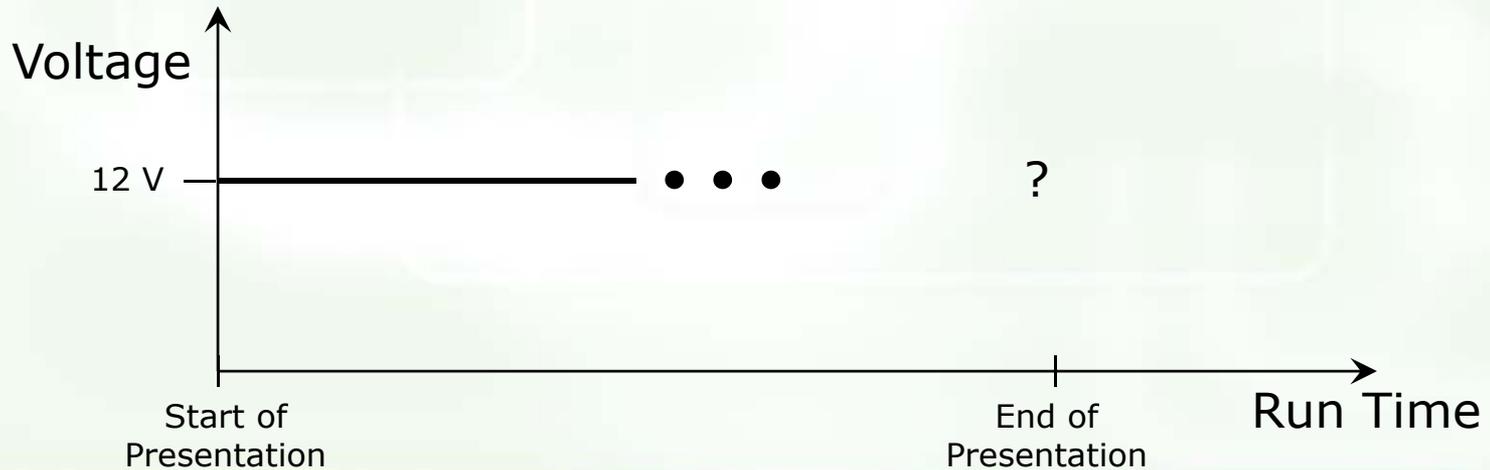
Fuel Cell Forklift & Refilling Station



Technical Accomplishments Battery vs. Jadoo XRT



The Tale of the Tape		
Lead Acid Battery	System	Jadoo XRT
9 lbs	Weight	22 lbs
11 Amp-Hr	Charge Storage	10.8 Amp-Hr
12 V	Electrical	12 V



Progress

FY' 09 – Milestones

- Strategy and curriculum report on training for State and Local Gov't Officials to be included in the annual report for year 1.
- Seminar presentation at the 2009 NHA Expo in Columbia, SC on education for State and Local Gov't Officials
- Annual report chapters detailing the training sessions during the year and evaluations for the State and Local Gov't Officials

Progress

Presentations:

- MASC Annual Meeting – Hydrogen 101

Webinars:

- 2009 NHA – Hydrogen 101: NHA Edition

Exhibitions:

- 2009 NHA South Carolina Hydrogen and Fuel Cell Pavilion
 - Local Government Rate
 - State Capitol media event
 - Educational demonstrations in SC Pavilion
 - Hydrogen Town Hall meeting
 - Guided tours through NHA 2009

Proposed Future Work

- Continue presentations with project partners
- Work closely with “trusted” economic development organizations to help them understand opportunities in hydrogen and become hydrogen/fuel cell ambassadors within their communities
- Provide more economic information to state and local government officials to help them lead deployment efforts
- Work with State Fire Marshal’s Office to provide information on hydrogen codes and permitting to relevant audiences

Project Summary and Key Points

- Working to increase hydrogen knowledge among state and local officials
- Targeting decision-maker's primary concerns:
 - Decrease in initial emphasis on hydrogen and fuel cell science
 - Increase in emphasis on near-term markets and project economics
- Targeting decision-maker's trusted community advisors
 - Economic developers

Project Summary and Key Points

- Utilizing existing communication networks
- Disseminating information via in-person meetings and webinars
- Evaluating and revising materials/presentation methods to maximize impact